ENVIRONMENT, HEALTH & SAFETY DIVISION
Safety Engineering Group
Mail Stop 75B-101

Integrated Functional Appraisal (IFA)

Advanced Light Source Division

June, 2005

IFA Team Members:

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Executive Summary

The Environment, Health and Safety Division (EH&S) conducted an Integrated Functional Appraisal (IFA) of the Advanced Light Source (ALS) Division during June, 2005. The Appraisal consisted of initial scope discussions, records review, and inspection of spaces to identify uncontrolled hazards. The inspection team was comprised of technical specialists from EH&S, the ALS Division Safety Coordinator, and others with safety responsibilities in ALS. Representatives from the Department of Energy (DOE) Berkeley Site Office (BSO) participated as observers during the inspections. The results of the Appraisal are as follows:

- All Formal Authorizations, including AHDs, RWAs and X-Ray Authorizations were reviewed. All were found to be current and appropriate for the work performed.
- Training compliance is excellent. JHQ completion at the time of the IFA was 100% and all authorized users on ALS formal authorizations have completed required training.
- Waste compliance is good. One container out of 18 failed testing and no NCARs were issued during the last year.
- SAAs are compliant and in good order.
- Trip hazards, bump hazards and narrow passages were noted that are a direct result of crowding on the ALS experiment floor.
- Some older machine equipment will need guarding or hardwiring to be in compliance with current OSHA regulations.
- The interviews conducted by the appraisal team demonstrated that the ALS employees have a high level of safety awareness and regard for ALS and EHS safety policies.

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1 Introduction

1.1 IFA Purpose

The Integrated Functional Appraisal (IFA) is a key component of Lawrence Berkeley National Laboratory's Integrated Safety Management (ISM) system. It is part of Core Function number 5 (Continuous Improvement) of the ISM concept, and forms one of the three tiers of the Laboratory's safety-assessment program that evaluates the ongoing effectiveness of divisions' Integrated Safety Management programs. Berkeley Lab’s Environment, Health and Safety (EH&S) Division has been conducting IFAs of all Laboratory organizations since 1996, with each organization undergoing review every three years. The ALS Division's last IFA was conducted during 2002.

1.2 Scope

The IFA included all areas within the ALS division that operate under a formal ALS authorization. Other divisions, including Chemical Sciences and EH&S, have formal authorizations operating in ALS space. These non-ALS authorizations were not included in the IFA. A general sample of ALS workspaces not covered by a formal authorization was also inspected. These spaces included shop, laboratory and office environments.

1.3 Compliance Emphasis

This year's IFA placed special emphasis on electrical safety compliance and on the findings of the recent OSHA inspections. The IFA team included several members cognizant in OSHA and NFPA regulations.

2 Appraisal Process

2.1 Team

2.1.1 *Selection*

Given the scope of worked identified and performed at the ALS, there was a need to assemble a team of EH&S professionals with the technical knowledge to address electrical safety, industrial hygiene, facilities safety, hazardous materials and waste management, ergonomics, laser safety and radiation safety. The IFA team comprised the following individuals:

Keith Heinzelman, IFA Team Leader, Health Physicist, EH&S

Bruce King, Industrial Hygienist, EH&S

Matt Kotowski, Safety Engineer, EH&S

Aaron Zude, Safety Engineer, EH&S

Ross Fisher, Safety Engineer, EH&S

Jeffrey Chung, Safety Engineer, EH&S

Marty White, Waste Generator Assistant, EH&S

Ted de Castro, Laser Safety Officer, EH&S

Georgeanna Perdue, ALS Safety Coordinator

Patricia Thomas, AFRD Safety Coordinator

Carol Ingram, DOE Berkeley Site Office

Kim Abbott, DOE Berkeley Site Office

Kathy Johnescu, DOE Berkeley Site Office

2.1.2 *Member roles and responsibilities*

The roles and responsibilities of each team member were to focus on assessing the hazards that applied to their field of practice and expertise. Each member was to document his/her findings and other feedback on the field appraisal forms.

2.1.3 *Meetings*

On June 22, 2005 the IFA team met to review the scope of the appraisal. The group reviewed the formal authorizations and discussed areas to be included in the appraisal.

2.2 Defining Appraisal Areas

2.2.1 *Document and database reviews*

All Formal Authorizations were reviewed, which included AHDs, RWAs, RWPs, LASs, X-Ray Authorizations and SAAs. The HEAR database was used to generate a list of all ALS spaces. Other documents reviewed include the OSHA Audit findings, ALS Integrated Safety Management Plan, the Waste Compliance Report, the LCATS database, and the 2002 ALS IFA report.

2.2.2 *Identification of Facility-level operations*

The ALS Division has a Final Safety Analysis Document (FSAD) that covers the operation of the ALS accelerators (linac, booster ring and storage ring).

2.2.3 *Identification of Medium and High Hazard spaces and operations*

Medium and High Hazard spaces were identified in the review of all formal authorizations. In addition, team members met with the ALS Safety Coordinator to review other division work to determine if that work would require a formal authorization. The Medium and High Hazard spaces include:

Beamline 4.0 (laser AHD)

Beamline 7.3.3.1 (laser AHD)

Beamline 10.0 (gas mixing AHD)

Beamline 12.2.2 (laser AHD)

ALS Experiment Floor (Hazardous Gas AHD)

Building 27 Room 101 (RF Test Stand AHD)

Building 6 Room 2215 (X-Ray Authorizations)

ALS Accelerators (RWA 5123)

2.2.4 *Identification of higher potential line management authorized work in technical work spaces*

Spaces where higher potential line management authorized work is performed include:

Building 10 Room 102 (User Chemistry Lab)

Building 10 Room 104 (Chemical Storage)

Building 10 Room 108 (High bay and shop area)

Building 10 Room 111 (User Shop)

The work in these areas and other work in the ALS division were reviewed against the requirements for Formal Authorizations listed in Pub 3000 Chapter 6 Appendix B. All work requiring a Formal Authorization is covered by a Formal Authorization.

2.2.5 *Identification of representative non-technical work space*

Using the HEAR database and upon recommendations from team members and the ALS Safety Coordinator, a list of representative office space was identified for inspections. This list included office space in Buildings 2, 6, 7, and 80.

2.2.6 *Scheduling of space reviews/inspections*

Inspections were scheduled to accommodate as many team members as possible. The individuals responsible for each of the areas on the inspection scheduled were contacted and asked to attend the inspection or have a representative present.

2.3 Space reviews

The inspections were scheduled to ensure that appropriate subject matter experts were present during each inspection. For example, the laser safety expert was present for inspections of areas containing lasers, but not necessarily present for office inspections.

The IFA team performed thorough inspections of areas within the ALS division. For example, on beamlines containing a laser covered by an AHD, the team inspected the entire beamline and the areas surrounding it for all types of hazards, including seismic, electrical, chemical, etc.

2.4 Interviews

In each area inspected, the individual responsible for the area was present to answer questions about the work performed in the area and the measures taken to ensure safety.

3 Results

3.1 Categories

3.1.1 *Noteworthy Practices*

Practices and conditions that demonstrate exemplary initiative and effort, that go beyond compliance, that contribute additional EH&S value to the Lab, that might be shared as Best Practices with others, etc.

3.1.2 *Observations*

Practices and conditions that are not necessarily non-compliant as observed, but that reflect opportunities for improvement or that with some additional level of effort could achieve Best Practices status.

3.1.3 *Findings*

Clear cases of practices or conditions that do not comply with OSHA, building code, LBNL policy, etc. Findings are deficiencies and must be corrected.

3.2 Documentation

Observations and findings were collected by the ALS EHS Administrator. They are compiled in Attachment C.

3.3 Facility Authorizations

3.3.1 *SADs, FSADS*

The ALS had one SAD, covering operation of the ALS accelerators.

3.3.2 *Other BAAQMD, EPA, EBMUD Permits*

The ALS is included in the LBNL site Solvent Wipe Program. Quarterly, the ALS solvent wipe use is reported to the EHS Environment Protection Group.

3.3.3 *Status of the authorizations.*

The ALS SAD is being updated in preparation of the DOE review of Top-Off Mode. The SAD is reviewed periodically and updated whenever it is necessary to make changes to the Safety Envelope.

3.4 Formal Work Authorizations

The ALS Division is responsible for several Formal Work Authorizations, including AHDs, X-Ray Authorizations, SAAs and an RWA. The complete list of these authorizations is presented in Appendix A.

3.4.1 *Status of renewals*

All active AHDs have been renewed within the last year.

3.4.2 *Current personnel*

The personnel listed as authorized users on the various Formal Authorizations are the current personnel. The PI associated with each authorization is responsible for keeping the authorized users list up to date.

3.4.3 *Training*

The training for each authorized user was verified through the EH&S Training Database. All training is current and meets the requirements of the various authorizations. Individual supervisors and PIs are responsible for ensuring the training of

their employees and visitors. The ALS Division verifies current training through the JHQ process.

3.4.4 *Authorization content reflects current conditions and requirements*

Based on the IFA Team walkthroughs and interviews with ALS personnel, the authorizations reflect the current conditions and requirements.

3.4.5 *Technical occupational safety and health issues review*

The IFA team had relatively few findings and observations considering the many work activities in the areas reviewed. Several of the items noted were related to a crowded work environment. The findings and observations include trip hazards, overloaded power taps, unsecured equipment stored on top of other equipment, exposed sharp corners, etc. A complete list of findings and observations can be found in Appendix C.

3.4.6 *Validation of Hazard Identification Database (HEAR or equivalent)*

The HEAR database is reviewed and updated annually after a wall-to-wall walkthrough of ALS space by the ALS EHS Coordinator and Administrator. Formal Authorizations are the responsibility of the Principal Investigator and renewals are tracked by the ALS EHS Coordinator.

3.4.7 *Work Smart Standards Envelope*

The ALS EHS Coordinator reviews changes to work authorizations and compares the new work to current WSS. All current work is covered by the WSS envelope.

3.5 Line Management ('Self-Authorization') Space/Operations

Self-Authorization space within the ALS division includes an ALS user chemistry lab, shop space in buildings 27, 46 and 10. While some findings and observations were noted by the IFA team, the areas are in general in good shape and the work is conducted following EH&S guidelines. See Appendix B for a list of Line Management Operations.

3.5.1 *Is Line Management authorized work properly identified*

Line managers are responsible to inform the division of new work. This is verified by the EHS Coordinator during quarterly

walkthroughs. The IFA appraisal team did not find any line management authorized work that required a formal authorization.

3.5.2 *Validation of Hazard Identification Database (HEAR or equivalent)*

The HEAR database is used to track line management work and the associated hazards. The database is updated annually by the EHS Administrator. The database is in good shape but needs to be updated with regard to Formal Authorizations.

3.5.3 *Technical occupational safety and health issues review*

The IFA team had relatively few findings and observations considering the many work activities in the areas reviewed. Several of the items noted were related to old machine equipment that is not in compliance with current standards. The findings and observations include several machines not hard wired and several machines without required guarding. A complete list of findings and observations can be found in Appendix C.

3.6 Non-Technical Space/Operations

A cross section of non-technical division space was reviewed, including office space in buildings 2, 6, 7 and 80. In general, the office space visited was in good order, with several examples of excellent ergonomic setups. Exit paths are clear, however, some of the office space is extremely crowded, leaving little room for duck and cover. A complete list of findings and observations can be found in Appendix C.

4 Recommendations

Recommendations for addressing specific observations and findings are presented in Appendix C.

General recommendations are:

- The ALS should pay particular attention to safety issues that arise due to overcrowding of the ALS experiment floor. The trip hazards, bump hazards, sharp edges and narrow passages noted above have potential to become more serious issues as more beamlines and more researchers crowd into the area in the future.
- More effort should be made to keep clear areas for duck and cover.

- All machine equipment should be inspected and brought up to current standards.

5 Corrective Action Tracking and Follow-up

All Findings should be tracked through the LCATS system.

6 Noteworthy Practices

Several noteworthy practices and policies were noted during the review. Most noteworthy is that the ALS has safety professionals, which include a full time EHS coordinator, a part time EHS administrator and a full time matrixed Radiological Control Technician (RCT). The EHS coordinator and administrator conduct quarterly walkthroughs of all division space. In addition to the safety professional, the ALS has a team of Beamline Coordinators, who walk the ALS experiment floor daily and coordinate safety inspections of all user experimental equipment.

Also noteworthy are the safety review processes. These include the experiment review process, the beamline review process, the QUEST program and the radiation safety program. In one way or another, these programs involve all employees of the ALS.

Also, the Key Enable procedure is an outstanding process that ensures new and modified beamlines are thoroughly inspected for all safety requirements before being brought online. This process was developed by the ALS. It demonstrates exemplary initiative and goes beyond compliance.

7 Conclusion

The generally good state of ALS work spaces, including ergonomic setups, and the good training and waste compliance indicate the ALS is effectively implementing their Integrated Safety Management Plan.

Appendices

Appendix A List of Facility and Formal Authorizations

Appendix B List of Line Management Operations

Appendix C Technical Occupational Safety and Health Inspection Observations and Findings

Appendix A List of Facility and Formal Authorizations

AHDs:

	Location	PI	Hazards addressed in AHD
AHD 169	Bldg 27	Kwiatkowski	Ionizing Radiation Non-ionizing Radiation Power Supplies Solvents and cleaners Rotating Machinery Hot Surfaces and Fluids
AHD 2028	ALS Floor	Feinberg	Health Hazard Gases
AHD 2042	BL 7.3.1.1	Scholl	Class 4 Lasers
AHD 2084	BL 4.0	Young/Scholl	Class 3B & 4 Lasers
AHD 2086	BL 12.2.2	Clark/Caldwell	Class 4 Lasers
AHD 2099	BL 10.0	Bozek	Health Hazard Gases Pressure
AHD2101	BL 10.0.1	Bozek	Class 4 Lasers

Radiological Authorizations:

	Location	PI	Hazards addressed
RWA 5123	Bldg 6	Pusina	Prompt radiation from ALS accelerators
X-Ray	Bldg 6-2215	Denlinger	X-Ray machine
X-Ray	Bldg 6-2215	Church	X-Ray machine
RWP 05-004	BL 7.3.3	Feinberg	Sealed radioactive sources
LAS L017	BL 6.3.2.1	Allred	Low activity radioactive sources

SAAs:

Building	Room	Responsible Person
27	101	James Julian
10	102	John Pruyn
10	104	John Pruyn
80	12	New supervisor
6	2233	Mary Giles
6	2261	Cheryl Hauck
6	BL 12	Brian Hoef

Other Authorizations:

	Location	Responsible Person
Solvent Wipe Permit	80	Dan Coulomb
	ALS	John Pruyn

Appendix B List of Line Management Operations

Building 10 Room 102 (User Chemistry Lab)

Building 10 Room 104 (Chemical Storage)

Building 10 Room 108 (High bay and shop area)

Building 10 Room 111 (User Shop)

Appendix C Technical Occupational Safety and Health Inspection Observations and Findings

*Recommendations are noted only where the corrective action is not obvious from the wording of the Finding.

Building	*Room*	*Observation (O)/Finding (F)*	*Recommendations*
2	402	(O) laptop power cord trip hazard	move laptop to clear area
2	416	(O) no duck and cover space	clear space beneath desk
6	2101	(F) water cooler needs securing	*
6	2104	(O) Recommend seismic lip on top of lateral file to contain balance	*
6	2215	(F) electrical disconnect in far corner not accessible (J. Denlinger)	clear path to the disconnect
6	2215	(F) power strip mounted to wall (D. Baker)	detach power strip from wall
6	2215	(F) maintain aisle space (J. Denlinger)	*
6	2215	(F) secure x-ray enclosures (W. Thur)	*
6	2261	(F) chemical storage in SAA cabinet (B. Bates)	store all non-waste items outside the SAA cabinet
6	2261	(F) trip hazard from extension cord cables on floor, need cable covers in 2 places (F. Sannibale)	*
6	2261	(F) monitor on top of cart (F. Sannibale)	secure the monitor or move it to a more appropriate location
6	2261	(F) heavy panels on top of fume hood (B. Bates)	secure the panels or move them to a more appropriate location
6	2261	(O) check power strip loading (D. Baker)	verify loading is within design criteria and, if not, use alternate power sources
6	BL 10.0.1	(F) gases stored under table with regulators attached	remove regulators from gas cylinders when stored
6	BL 4.0	(O) sharp corners on air tables near aisles	set up orange cones or equivalent at corners, or soften corners

Building	Room	Observation (O)/Finding (F)	Recommendations
6	BL 4.0	(O) heavy equipment on top of portable desk	*
6	BL 4.0	(O) partitions need to be secured	*
7	214C	(O) no duck and cover space	*
7	214S	(F) overloaded relocatable power tap (space heater plugged in)	space heater should be relocated to appropriate power source
7	214S	(O) no duck and cover space	*
7	214U	(F) overloaded relocatable power tap (space heater plugged in)	space heater should be relocated to appropriate power source
7	214U	(O) overhead cabinet doors should be closed (no lip on shelves)	*
10	100	(F) gas cylinder stored with regulator attached (G. Perdue)	remove regulators from gas cylinders when stored
10	102	(F) some chemicals in fume hood are not labeled (J. Pruyn)	*
10	102	(F) hazardous chemicals could fall/spill in upper cabinets (J. Pruyn)	provide secondary containment and secure latches
10	102	(F) HF exposure kit Ca-gluconate gel is expired (J. Pruyn)	*
10	104	(F) HF exposure kit Ca-gluconate gel is expired (J. Pruyn)	*
10	108	(F) replace 4-wheel chair	*
10	108	(O) remove portable eyewash	*
10	108	(F) employee soldering without eyewear	counsel employee to wear safety eyewear
10	111	(F) belt sander needs upper guard	*
10	111	(O) grinder needs stronger retaining tongues	*
10	111	(F) inadequate clearance around machines to reach emergency shutoff	*
10	111	(O) no SAA in shop for oily rags	*

Building	Room	Observation (O)/Finding (F)	Recommendations
27	101	(O) front door sign is illegible	*
27	101	(F) 480 V transformer should be screened.	This work must be performed by Facilities electricians.
27	101	(F) flexible cord attached to building	detach cord from wall
27	101	(F) materials stored on top of transformer	*
27	101	(O) need 48" clearance sign on 480V transformer	*
27	101	(F) need chuck guard on lathe	*
27	101	(F) top guard missing on drill press	*
27	101	(F) hard wire drill press and lathe	*
46	144	(O) cable trays may not be properly grounded	*
46	144	(F) outlet strips on benches may need to be hard wired	*
46	156	(F) hard wire drill press	*
46	156	(F) panel clearance	*
46	156	(F) shop benches need permanent wiring	*
46	156	(F) emergency light unplugged	*
46	156	(O) door opens wrong direction	*
46	144B	(F) 4-wheel chair	
80	109	(F) partitions need to be secured	*
80		(O) Radiation survey procedure not clear on what surveys are required and how they should be documented.	modify the procedure to make the process clear